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## SOURCE OF PRENATAL CARE AND INFANT BIRTHWEIGHT: THE CASE OF A NORTH CAROLINA COUNTY

by

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### ABSTRACT

The impact of a comprehensive prenatal care program on the birthweights of infants born to low-income women is assessed. Women receiving care through the prenatal program of the Guilford County public health department were compared to pregnant Medicaid-eligible women in the same county, who received prenatal care primarily from private-practice physicians. The percent low birthweight was 8.3 for the health department women compared to 19.3 for the Medicaid women. After statistically controlling for differences between the two groups in race, marital status, WIC participation, quantity of prenatal care, and other risk factors, the chance of a Medicaid woman having a low-weight birth was still more than twice as great ( $p = .007$ ). Most of this birthweight differential between the Medicaid and health department women was among the subgroup of women not having an adequate quantity of prenatal care. A case-management approach and greater use of services ancillary to basic obstetrical medical care appear to contribute to the better birthweight outcomes in the health department. Implications for provision of prenatal care services through the Medicaid program are considered.

## INTRODUCTION

It has been convincingly demonstrated that low birthweight greatly increases the risk of subsequent infant morbidity and mortality (1,2). Low birthweight also frequently results in higher medical care costs (3). Thus the prevention of low birthweight has become a major concern of the health care community. Some of the more important factors shown to influence the risk of low birthweight are race, age, marital status, socioeconomic level, multiple birth, and prenatal care (4).

The impact of prenatal care on birthweight has received considerable attention, in part because, among the major risk factors, prenatal care is probably the most amenable to change through deliberate health programs. Most studies of prenatal care and birthweight have looked at the quantity and timing of prenatal care, such as number of visits or month prenatal care began. More refined measures such as the Kessner Index consider number of visits and month care began in relation to length of gestation (5). Such quantitative measures of care may be easily calculated from birth certificate data if the required components are recorded. Receiving much less attention, however, is how the scope and quality of prenatal care affect birthweight. The recent report by the Institute of Medicine on preventing low birthweight points to the need for more research on the content of prenatal care (4).

A comprehensive prenatal care program for low-income women in thirteen California counties resulted in significantly lower rates of low birthweight for these women in comparison to a matched control group of Medicaid women (6). The present study looks at the effect of comprehensive prenatal care on the birthweights of infants born to low-income women in a North Carolina county. Women receiving prenatal care at the Guilford County public health department are compared to Guilford County women on Medicaid, who received prenatal care mainly from private-practice physicians. It was hypothesized that the comprehensiveness of the health department's prenatal care program has a substantial positive impact on birthweights. If true, this would have important implications for provision of prenatal care to low-income women, where the problem of low birthweight is especially severe.

## METHOD

Guilford County, North Carolina is a metropolitan area with a population of approximately 325,000. The county has a large and active public health department, with around 340 full-time-equivalent staff positions. Prenatal care is provided at two sites, in the cities of Greensboro and High Point. This project was initiated as a means of evaluating a health department program in terms of

outcome (birthweight), rather than a "process" measure such as number of clients served. The prenatal care program was chosen because it is one of the larger health department programs, and because its outcome could be assessed using information from birth certificates. The results of this study turned out to have implications beyond the effectiveness of this particular health department program.

The first step was to indicate which of the 4037 Guilford County resident birth certificates for 1984 belonged to women who were in the prenatal care program of the health department. A list of the 426 women who received prenatal care at the health department and had a live birth in 1984 was provided by the health department, containing the name of each woman, date of delivery, date of her birth, and race. Computer and subsequent manual matching using these variables resulted in successful identification of 396 birth certificates for babies born to health department women (a matching rate of 93 percent). Reasons for non-matching could be that the woman moved out of Guilford County before delivery, incorrect listing of another county of residence on the birth certificate, or that the woman was not a resident of Guilford County and this was not determined by the health department. Thus the "case" group becomes Guilford County residents who received prenatal care in this health department.

Guilford County women on Medicaid were chosen as a comparison group, primarily because they could be identified from Medicaid paid claims data. In Guilford County there is an agreement between the health department and the obstetricians that women who are eligible for Medicaid and then become pregnant will receive prenatal care through the private-practice physicians. The health department does not have the capacity to serve all indigent women in the county and its first responsibility is to the women with no insurance. Thus pregnant Medicaid-eligible women in this county are referred to the obstetricians' office-based practices by the health department or by the Department of Social Services. This type of arrangement may not exist in some counties in North Carolina, and indeed many Medicaid-eligible women in other areas do receive prenatal care from public health departments. It so happens, however, that in Guilford County the comparison of "health department" and "Medicaid" birth outcomes becomes essentially a comparison of public and private sources of care.

Like the women receiving prenatal care at the health department, the Medicaid-eligible women are predominantly poor and nonwhite. The income level for Medicaid eligibility is only one-third to one-half the poverty level in North Carolina, so this is a very low-income group of women that may differ in some ways from the health

department women. A woman receiving prenatal care at the health department must be a resident of Guilford County and certified as having a family income of less than the poverty level. Potential problems of comparability between these two groups are considered later in this report.

In Guilford County most of the active obstetricians rotate hospital duty and thus the same physicians handle the deliveries of both the health department and Medicaid women. Therefore any differences in low birthweight between the two groups may be attributed mainly to differences in prenatal care rather than to differences in hospital management or intrapartum care.

Birth certificates for Medicaid women were identified by matching to Medicaid paid claims using name and age of mother. All 1984 inpatient hospital Medicaid claims for Guilford County residents with an ICD-9-CM diagnosis of 640-676 (conditions related to pregnancy and delivery) were selected, resulting in an unduplicated count of 556 women. Ninety percent (or 500) of these claims were successfully matched to birth certificates. It was expected that some of these claims would not match since some Medicaid hospital stays are for obstetrical complications with no live birth occurring at the time. The matching indicated that 138 women were in both groups, i.e., they received prenatal care at the health department and Medicaid paid for their hospital delivery. The health department and private-practice physicians have agreed that if a woman begins prenatal care at the health department and subsequently becomes eligible for Medicaid, she will complete her prenatal care at the health department for the sake of continuity, though at the time of delivery Medicaid would be available to pay for hospital charges. These women are counted in the health department group here since that is where prenatal care was received.

Besides the indicator of whether the woman received prenatal care in the health department or from a private-practice physician through Medicaid, most of the information used in this analysis is from the birth certificate: race, age, marital status, education, single or multiple birth, previous fetal or live-born death, birthweight, and quantity of prenatal care. The Kessner Index was used as an indicator of the quantitative adequacy of prenatal care. It considers number of visits and month care began in relation to length of gestation (see Appendix for

definition).<sup>\*</sup> For purposes of this analysis, quantity of prenatal care was dichotomized into adequate ("adequate" Index) or not adequate ("intermediate" or "inadequate" Index).

In addition to the information from the birth certificate, an indicator of whether the woman participated in the Special Supplemental Food Program for Women, Infants, and Children (WIC) prior to delivery was added. This was done by selecting Guilford County residents from a file of WIC women having a live birth in 1984 and matching on name and date of delivery. Out of 687 WIC records for Guilford County residents, 650 or 95 percent were matched to a 1984 Guilford County birth certificate.

The main analytical tool used here to address the question of the effect of source of prenatal care on birthweight among low-income women was logistic regression. An indicator (1 or 0) of whether or not the birth was low-weight (under 2500 grams) was used as the outcome measure. In assessing the effect of source of prenatal care on birthweight, it was necessary to control for other important influences on birthweight, for example, race, marital status, and quantity of prenatal care. The usual regression techniques are not appropriate when the dependent variable is dichotomous. Using logistic regression allows assessment of how source of prenatal care affects the odds of having a low-weight birth, after controlling for other important influences.

## RESULTS

Table 1 describes 1984 live births to Guilford County residents in terms of source of prenatal care, birthweight, and selected risk factors for low birthweight. Health department women and Medicaid women accounted for 9.8 and 9.0 percent respectively of 1984 Guilford county resident births. Women in these two groups were much more likely than other Guilford County women to be nonwhite, unmarried, under age 18, of low education, on WIC, and to have had prenatal care that was not adequate in quantity. Comparing the Medicaid and health department groups, the Medicaid women were considerably more likely to be nonwhite, unmarried, and not on WIC. Since most Medicaid women qualified in 1984 through the Aid to Families with Dependent Children (AFDC) program which provides support mainly to single-parent households, the very high proportion of the women that were unmarried is understandable.

<sup>\*</sup>Completed weeks of gestation, calculated from date of birth and date of last menstrual period on the birth certificate, was the only variable from the birth certificate used in this analysis that had more than a few missing values. Where only day of the month of date of last menstrual period was missing, the 15th was imputed. If calculated weeks of gestation was less than 18 or greater than 48 for these live births, gestation was recoded to unknown. The calculated weeks of gestation was then compared to birthweight and, where the two were clearly incompatible, weeks of gestation was recoded to unknown. These procedures, plus the records with month or year of date of last menstrual period missing, resulted in about two percent of the births having unknown weeks of gestation, and therefore unknown Kessner Index.

Table 1

**1984 Live Births to Residents of  
Guilford County, North Carolina  
By Source of Prenatal Care, Birthweight,  
and Selected Risk Factors for Low Birthweight**

	Source of Prenatal Care		
	Public Health Department	Private Practice Physician Through Medicaid	All Other
Number of Births	396	362	3279
<b>Percents</b>			
Under 2500 Grams	8.3	19.3	7.1
Nonwhite	65.4	81.5	25.2
Unmarried	60.6	86.7	12.5
Age under 18	17.2	13.5	4.2
Education <12 years	47.8	45.6	14.9
Multiple Birth	2.8	3.9	1.9
Previous Fetal or Live-Born Death	20.2	24.3	20.3
Not on WIC	22.5	55.5	94.4
Prenatal Care Not Adequate in Quantity (Kessner Index)	44.0	38.2	14.2

Table 2

**Estimated Relative Odds of Low Birthweight  
With Presence of Selected Risk Factors\*  
(1984 Guilford County Health Department and Medicaid Births, N = 758)**

Risk Factor	Relative Odds	p
Nonwhite	1.58	.18
Unmarried	1.80	.11
Age under 18	1.92	.06
Education <12 Years	.86	.57
Multiple Birth	18.60	<.0001
Previous Fetal or Live-Born Death	1.94	.01
Not on WIC	1.60	.06
Prenatal Care not Adequate (Quantity)	1.37	.18
Medicaid Provider of Care (vs. Health Dept.)	2.08	.007

\*These odds are derived from a logistic regression model and refer to the relative likelihood of a woman with the characteristic delivering a low-weight baby compared to a woman without the characteristic. These are **independent** effects, i.e., after controlling for the effects of all other variables in the model. The p values refer to the probability that this effect is due to random variation, given the sample size (758) and relative frequency of the variable (1 or 0). The model likelihood ratio chi-square for testing the joint significance of all variables in the model is 78.82 with 9 degrees of freedom,  $p < .01$ .

The difference between the Medicaid and health department women in percent of births that were low-weight, 19.3 versus 8.3, is dramatic. (This difference is statistically significant at much less than  $p = .001$ .) Perhaps most surprising is that the percent of low-weight births among the health department women was only slightly higher than that for the all-other group shown in Table 1, in spite of this being a "high-risk" group. The health department women had better birthweight outcomes than the Medicaid women even though the quantity of prenatal care (in terms of number of visits and timing of care) received by these women was, on the average, lower than that for the Medicaid group. Further examination of the data revealed that the somewhat lower quantity of care received by the health department women was entirely a function of starting prenatal care after the first trimester, rather than having fewer visits once care was begun.

In order to conclude more definitely that the nature of the prenatal care provided in the health department contributes to this difference in low birthweight, it is necessary to control for differences between the two groups in other risk factors for low birthweight. Table 2 considers the results of a logistic regression model with low birthweight as the dependent variable. Only the health department and Medicaid births are included here ( $N = 758$ ). It can be seen that even after controlling for differences between the health department and Medicaid women on race, marital status, WIC, quantity of prenatal care, and the other measured risk factors, a woman receiving prenatal care from a private-practice physician through Medicaid was on the average more than twice as likely to have a low-weight birth ( $p = .007$ ). Reasons for this strong effect will be considered in the following section.

The strongest effect in the model is that of multiple birth. A woman with a non-singleton birth was over 18 times more likely to have a low-weight baby than a woman with a singleton birth, independent of all other factors. Not being on WIC independently increased the chances of having a low-weight birth by 60 percent among the low-income women in this study. This is further corroboration of the effectiveness of the WIC program in preventing low-weight births. The independent effect of race on low birthweight shown here is not highly significant ( $p = .18$ ), but it should be remembered that these two groups of women are predominantly nonwhite, with much less variation in race than would be found among all the births of a county or state. Other characteristics with a strong, independent effect on the probability of a low-weight birth are being unmarried, age under 18, and having had a previous fetal or live-born death.

## DISCUSSION

Most evaluations of the effect of prenatal care on birth outcome have looked at the quantity of care in terms of the month of pregnancy in which care began and total number of prenatal visits. Indeed, these are the variables most likely to be recorded on birth certificates, and measures of content or quality are much harder to obtain. In the present study, the health department women actually had a lower quantity of prenatal care, on the average, than the Medicaid women, while having much better birthweight outcomes. Thus if consideration of prenatal care had been limited to the Kessner Index or other quantitative measures of care, little effect on low birthweight would have been shown among these low-income women. Examining the nature and content of the prenatal care provided by the health department may provide insight concerning this differential.

The Guilford County health department provides a comprehensive, coordinated system of prenatal care with extensive written protocols. Each woman is evaluated upon entry and an individual prenatal care plan is developed. Special provisions are made to screen and educate the women about preventing preterm labor. The highest-risk women are referred to a high-risk maternity clinic at Moses Cone Hospital, a tertiary care center. Health education, counseling, and other health department services are also provided for these women. The women at nutritional risk are referred to the WIC program, which is administered through the health department. This link with WIC is very important, and Table 1 reveals that nearly 80 percent of the health department women are on WIC compared to less than half of the Medicaid women. Table 2 indicates that WIC does have a significant, positive, and independent impact on birthweight in this county. Higher participation in WIC could in fact be considered as one quality of the health department prenatal care program since referral is routine, and if the WIC variable is left out of the regression model in Table 2 the effect of source of care increases from 2.08 to 2.44 ( $p = .0005$ ). It appears that the **case management** and coordination of services provided by the health department are very beneficial, and that possibly the Medicaid women in Guilford County are much less likely to benefit from such an approach.

Other studies have also shown the advantages of a comprehensive, coordinated approach to prenatal care, particularly for high-risk, indigent women. Sokol, et al. (7) evaluated a comprehensive prenatal care project in Cleveland and found that women on the program had

significantly lower perinatal mortality and higher birthweights than women in a comparison group. They concluded that the major difference in prenatal care was in the **ancillary services** of the project, including non-medical services such as patient education, home visitation, nutrition assessment and counseling, and social service assessment and intervention. The present study, which goes further to incorporate multivariate adjustments for group differences, strongly supports this perspective. Starfield's review of the literature (8) points to the inability of studies to consistently demonstrate that the **amount** of prenatal care alone influences the frequency of low birthweight, and concludes that the scope and content of care are most important, particularly for high-risk populations. The Institute of Medicine's report on preventing low birthweight indicates that successful prenatal care projects frequently offer a "package" of services including outreach, counseling, and other non-medical services. Certain populations, especially the poor and very young, "may be better served by public facilities offering a range of services than by physicians in private practice, who traditionally provide only medical care." (4)

One aspect of the Guilford County health department's prenatal care program that may contribute to its better birthweight outcomes, compared to the Medicaid women, is the heavy reliance on nurse practitioners for the provision of prenatal care. Seven nurse practitioners in the health department provide the first-line, ongoing care and communication, with specific problems or complications referred to physicians. The Institute of Medicine's report (4) suggests that these providers tend to relate to their patients in a nonauthoritarian manner and to emphasize education, support, and patient satisfaction. They are likely to spend more time per visit with their patients than are office-based physicians, and women served by nurse-midwives and practitioners are more likely to keep appointments for prenatal care and to follow specified treatment regimens. In Guilford County, missed visits at the health department are followed by telephone calls, or home visits if necessary.

The follow-up, education, and linkage to other programs found in this health department would probably be less important for a group of highly educated and motivated pregnant women, but they appear to make a great difference for poor pregnant women in Guilford County. Peoples and Siegel (9) concluded that a comprehensive maternity and infant care (MIC) project in North Carolina had the most benefit for those mothers and infants at very high risk. As further indication that the benefits of comprehensive prenatal care are greatest for the highest risk women, the data for this study revealed a strong

interaction between source of prenatal care and quantitative adequacy of care. The difference in low birthweight percent between the health department and Medicaid women was predominantly among those women not having an adequate quantity of prenatal care. The logistic regression analysis showed that, controlling for other differences, the risk of low birthweight was 4.5 times greater for the Medicaid women than for the health department women among those not receiving an adequate quantity of prenatal care ( $p = .001$ ). For those women whose care was quantitatively adequate, however, the relative risk for the Medicaid women was only 1.2 and not significant ( $p = .59$ ). Thus the ancillary services of the health department program appear to be most beneficial among those women who start prenatal care late or have an insufficient number of visits.

Another interesting interaction is that between source of prenatal care and WIC participation. Being on WIC made more difference in birthweight outcome within the Medicaid group than within the health department group. Controlling for other differences, Medicaid women not on WIC were 1.6 times more likely on average to have a low-weight birth than were the Medicaid women on WIC ( $p = .13$ ). In a statewide study in Missouri, Schramm (10) found significantly higher birthweights for Medicaid women on WIC. For the Guilford County health department women, the regression equation does show that not being on WIC increases the chances of a low-weight birth by 1.5, but this ratio is not significant at  $p = .39$ . It appears that WIC tends to be more effective in preventing low birthweight among the Medicaid women, who probably receive less education, counseling, and other services ancillary to obstetrical medical care.

Any retrospective study, where random assignment to a "case" and "control" group is not possible, is subject to selection bias. Though the educational levels of the Medicaid and health department women were very similar (Table 1), there was no information on income in the present study to use as a control. Since the income cutoff for Medicaid in North Carolina is extremely low, it is likely that the Medicaid women in this study were, on the average, poorer than the health department women. Some of the unmarried health department women, while below the poverty level, could have had too much income to qualify for Medicaid, and perhaps this contributes to their better birthweights. There could be substantial differences between the health department and Medicaid women on medical complications of pregnancy, social and occupational stress, substance abuse, or other factors that affect birthweight and have not been measured or controlled for in this study.

Another possible source of bias is that some women are eligible for Medicaid because they are "medically needy," which usually means that because of previous medical expenses they "spend down" to the Medicaid income level. Thus some of these women could be on Medicaid because of prior health problems. Some could be "medically needy" at the time of delivery, however, because of their expenses for prenatal care or because of previous medical expenses for children in the family rather than for themselves. An examination of the Medicaid claims data revealed that around 25 percent of the Guilford County Medicaid women in the study were "medically needy," rather than qualifying through AFDC or other categorical programs. But the incidence of complicated deliveries among these women, as determined by the principal hospital diagnosis on the Medicaid claims form, was only about one-seventh higher than that for the women qualifying primarily through AFDC. This does not suggest a markedly higher level of complications among the Medicaid women as compared to those receiving prenatal care at the health department. Neither did an examination of indicators of complications of pregnancy or delivery that are recorded on the birth certificates suggest large differences between the Medicaid and health department women. Though these indicators are definitely underreported on the birth certificates, the rate of complications shown for the Medicaid women was only around one-sixth higher.

These potential biases could explain part of the much lower birthweights among the Medicaid women, but it is highly unlikely that their control would account for all of the differential. A look at the subset of 138 women who received prenatal care at the health department but qualified for Medicaid before delivery also suggests that it is the prenatal care program of the health department, rather than unmeasured differences between the health department and Medicaid women, that accounts for a large part of the birthweight differential. Like the Medicaid women receiving care from private physicians, these 138 women were largely nonwhite and unmarried, yet their percent low birthweight was 9.4 compared to 19.3 for the other Medicaid women. A logistic regression model for these two groups ( $N = 500$ ) using the same control variables as in Table 2, indicated that the risk of low birthweight was 2.0 times as great for the Medicaid women receiving care in the private sector compared to the 138 women receiving prenatal care at the health department and later being certified for Medicaid ( $p = .07$ ).

One possible contribution to the better birthweight outcomes among the health department women is that referrals are made to a high-risk prenatal care clinic at

Moses Cone Hospital in Greensboro for women determined to be at risk of preterm labor. Of the 396 women in the health department prenatal care program, about 20 percent received at least part of their prenatal care at this high-risk hospital clinic. It is not known how many of the Medicaid women were referred to this clinic, though they would be eligible if determined to be at risk for preterm labor. Like referral to WIC, however, the formal linkage to this clinic should be considered a benefit of receiving prenatal care at the health department and not as a "bias" when comparisons are made to the Medicaid group. In any case, inclusion in a regression model for the health department women only of an indicator of whether or not the woman participated in this high-risk clinic did not add significantly to the prediction of low birthweight within this group.

A remaining issue is the use of gestational age as a predictor of birthweight (11). In the present study, 75 percent of the Medicaid low-weight births were preterm ( $<37$  weeks) compared to 48 percent for the health department. One would expect that gestational age or a prematurity variable would be highly predictive of birthweight, and indeed this was the case when a prematurity indicator was added to the regression model in this study. But since the purpose of this study was to assess the effect of prenatal care on birthweight, it was not considered appropriate to control for gestational age in the regression model. Much of the positive effect of prenatal care on birthweight may be through lengthening gestation, as suggested by Showstack, et al. (11) The lower percent of low-weight births that are preterm for the health department women (48%) compared to Medicaid (75%) suggests that this is the case and, in fact, most of the higher overall percent low birthweight for Medicaid is due to a higher prematurity rate. The percent of total births that were term and low-weight (growth-retarded) was similar for the two groups: 4.3 percent for the health department women and 4.7 percent for the Medicaid group. Since gestational age is highly correlated with birthweight and is a major intervening variable for the effect of prenatal care, it should be "controlled for" in assessing the effect of prenatal care only if one wants to see if prenatal care affects birthweight other than by lengthening gestation.

We do not expect that the Guilford County health department is typical in North Carolina in terms of its prenatal care program and it would be desirable to replicate and expand this type of study. In other areas, Medicaid women receiving prenatal care in the health department could be compared to Medicaid women receiving care in private settings, eliminating some of the comparability problems of the present study. It is now possible to

match the Medicaid and WIC records to birth certificates on a statewide basis for North Carolina and we hope in time to identify women receiving prenatal care in health departments using a statewide automated health services information system. Besides seeing if the results shown here hold up in other geographic areas, it would be possible in an expanded study to examine the impact of prenatal care on important subcategories of low birthweight, such as births less than 1500 grams. The numbers were not large enough in the present study to support a more refined analysis of birthweight.

## CONCLUSIONS

Though this project was initiated to evaluate the effectiveness of a particular health department service, there are important implications for the provision of prenatal care to all low-income women. For women in poverty, a coordinated, comprehensive approach to prenatal care is essential. While visits for obstetrical medical care may alone be adequate for women with higher education and income, women with fewer resources need additional services such as health education, counseling, nutritional assessment, and outreach and follow-up. A case-management approach is needed to ensure that each woman receives the proper combination of services. The Medicaid program in particular needs to **promote** appropriate prenatal care rather than just paying for visits after the bills arrive. This approach to Medicaid-reimbursed care has begun in California with implementation of comprehensive prenatal care through specified Medicaid providers. The Institute of Medicine study (4) recognizes that the high-risk status of many Medicaid-eligible pregnant women means that they often need more services and more specialized care than low-risk women. It goes on to recommend that a standard prenatal care model be developed for high-risk women and that its use should be required in all Medicaid programs. We suggest that the prenatal care program of the Guilford County health department should be thoroughly examined as such a model is developed. A significant finding is that the success of this health department's program in preventing low birthweight is almost entirely through reducing preterm births rather than through reducing the incidence of intrauterine growth retardation.

While the present study has been largely a comparison of prenatal care in public and private settings due to the arrangements in Guilford County, the larger issue is the contrast between comprehensive and "traditional" prenatal care. We are not suggesting that the private obstetricians are doing anything wrong or questioning their clinical skills. In Guilford County many of the obstetricians with office practices also work in the health department clinics. What seems to make the difference are the services

that the health department **adds** to the obstetrical medical care. Physicians are frequently not able to hire educators, nutritionists, and other providers of ancillary services for their office staffs. What is needed is a **coordination** of services to assure that low-income women do get access to these needed non-medical components of prenatal care.

One way to improve the birthweight outcomes of pregnant Medicaid women would be to provide the capability for more public health departments with approved comprehensive prenatal care programs to serve some of these women. At the same time, the relative lack of private obstetrical services for women relying on Medicaid must be addressed. The current payment structure of many Medicaid programs results in the incentives being more toward managing the deliveries of Medicaid-eligible women rather than toward providing prenatal care. Increases in malpractice insurance premiums have led many obstetricians to decrease their level of obstetric care to high-risk women. In Guilford County, there were 36 obstetrician-gynecologists in 1984, yet only three individual OB/GYN physicians accounted for 50 percent of the prenatal care visits for Guilford County Medicaid eligibles that were paid for by Medicaid during that year. With access to prenatal care from the private sector being limited to only a few providers, some women may be discouraged from getting adequate care because the range of choice of providers is limited. One strategy to increase the availability of prenatal care in private-practice settings for Medicaid women would be greater employment of nurse practitioners by obstetricians to help provide the more routine prenatal care services. The lower cost of their time could help offset low payments by Medicaid, and some of the benefits of nurse practitioner care for high-risk women that were mentioned above might accrue.

In addition to improving the health of mothers and infants, better prenatal care for Medicaid women would likely save money for the Medicaid program. Korenbrot (6) predicted for California that one dollar spent on comprehensive prenatal care services would save the Medicaid program \$1.70 in reimbursement for neonatal intensive care costs alone by improving birthweights. Further savings are to be expected in costs for services for disabled and chronically ill children. Preliminary calculations based on the data from this study indicate that considerable savings could be achieved in North Carolina as well.

The issue of health care for the poor and uninsured has become more salient as cost containment efforts and competition among providers have increased in recent years. Poor women who are pregnant warrant special attention since the health of the next generation is at stake



too. As the Institute of Medicine report (4) states, full access to prenatal care requires a fundamental assumption of responsibility by the public sector for making such services available, either directly or through arrangements with private providers. Targeting resources to the poor, who account disproportionately for health problems, is an efficient use of public resources. But prenatal care alone will not do the job. There must be more emphasis on reducing the risks of low birthweight before pregnancy occurs through greater use of more general health improvement programs. Family planning services are a very important component and the data from Guilford County suggest that there is a particular need in this area among the Medicaid women. For the Medicaid women in Guilford County, 15.5 percent of the 1984 live births

represented a fourth or higher pregnancy, compared to 8.3 percent for the health department women. As Starfield (8) suggests, the benefits of prenatal care may be realized only when they are part of a longer-term program of adequate health care.

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## Appendix

### Criteria for Adequacy-of-Care Index Levels\*

Adequacy of Care	Trimester of First Prenatal Visit	Gestation (Weeks)	Number of Prenatal Visits
Adequate	First (1-3 months) and	18-21	and 3 or more
		22-25	and 4 or more
		26-29	and 5 or more
		30-31	and 6 or more
		32-33	and 7 or more
		34-35	and 8 or more
		36 or more	and 9 or more
Inadequate	Third (7-9 months) or	18-21	and 0 or not stated
		22-29	and 1 or less or not stated
		30-31	and 2 or less or not stated
		32-33	and 3 or less or not stated
		34 or more	and 4 or less or not stated
Intermediate	All other combinations		

\* Adapted from Kessner DM, Singer J, Kalk CE, Schlesinger ER. "Infant Death: An Analysis By Maternal Risk and Health Care." *Contrasts in Health Status*. Vol. 1. Washington, D.C.: Institute of Medicine. National Academy of Sciences, 1973.

Note: The Index was treated as missing if a component was missing or if calculated weeks of gestation for the live birth was less than 18 or greater than 48.

